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STUDIES IN THE CLASSIFICATION AND NOMENCLATURE OF THE BACTERIA

X. SUBGROUPS AND GENERA OF THE MYXOBACTERIALES AND SPIROCHAETALES

BY

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X. SUBGROUPS AND GENERA OF THE MYXOBACTERIALES AND SPIROCHAETALES

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Order V. **Myxobacteriales.** Ordo nov.

Motile, rod-like organisms, multiplying by fission, secreting a gelatinous base, and forming a pseudoplasmodium-like aggregation before passing into a more or less highly developed cyst-producing, resting state in which the rods may become encysted in groups without modification, or may be converted into spore masses.

There is one family only, the *Myxobacteriaceae.*

Family I. **Myxobacteriaceae** Thaxter, 1892, p. 394

Characters those of the order.

The following generic names have been used for organisms of this group.

Polyangium Link, 1795
Stigmatella Berkeley and Curtiss, 1857, p. 70
Chondromyces Berkeley and Curtiss, 1857, p. 313
Cystobacter Schroeter, 1886, p. 170
Myxobacter Thaxter, 1892, p. 403
Myxococcus Thaxter, 1892, p. 403
Myxobotrys Zukal, 1896, p. 346

The genera may be differentiated by the following key:

Key to the genera of Myxobacteriaceae

I. Cells not transformed into coccus-like spores when encysted.
A. Rods forming free cysts in which they remain unmodified. Cysts various, sessile or borne on a more or less highly developed cystophore. Genus I. *Chondromyces*

B. Rods forming large rounded cysts, one or more, free within a gelatinous matrix raised above the substratum.....Genus II. *Polyangium*
II. Rods transformed to form definite, more or less encysted, sessile or stalked masses of coccus-like spores.....Genus III. *Myxococcus*

Genus I. **Chondromyces** Berkeley and Curtiss, 1857, p. 313

Synonyms:

Stigmatella Berkeley and Curtiss, 1857, p. 70
Polycephalum? Kalch and Cke., p. 22
Cystobacter Schroeter, 1886, p. 170
Myxobotrys Zukal, 1896, p. 346

Rods forming free cysts in which they remain unmodified. Cysts various, sessile or borne on a more or less highly developed cystophore.

The type species is *Chondromyces crocatus* Berkeley and Curtiss.

Genus II. **Polyangium** Link, 1795, p. 65

Synonyms:

Myxobacter Thaxter, 1892, p. 394

Rods forming large rounded cysts, one or more, free within a gelatinous matrix raised above the substratum.

The type species is *Polyangium vitellinum* Link.

Genus III. **Myxococcus** Thaxter, 1892, p. 403

Rods slender, curved, swarming together after a vegetative period to form definite more or less encysted sessile masses of coccus-like spores.

The type species is *Myxococcus rubescens* Thaxter

Order VI. **Spirochaetales.** Ord. nov.

Synonyms:

Spirilloflagellata. Krzysztalowicz and Siedlicki

Protozoan-like in many characters. Cells usually relatively slender flexuous spirals: multiplication of cells apparently by longiiudinal division in some types, by transverse division in others, or both.

One family is recognized, *Spirochaetaceae.*

Family I. **Spirochaetaceae** Swellengrebel 1907, p. 581

Synonyms:

Spirochaetoidea Dobell, 1911, p. 536
Spironemaceae Gross, 1912, p. 83

Characters those of the order.

The following generic names have been used for organisms of this group:

Spirochaeta Ehrenberg, 1833, p. 313.
Spirochoeta Dujardin, 1841, p. 209
Spirochaete Cohn, 1872, p. 180
Treponema Schaudinn, 1905, p. 1728
Miscrospironema Stiles & Pfender 1905, p. 936
Spironema Vuillemin, 1905, p. 1567
Borrelia Swellengrebel, 1907, p. 582
Cristispira Gross, 1910, p. 41
Saprospira Gross, 1911, p. 188
Spiroschaudinnia Sambon, 1913, p. 833.

The genera recognized may be differentiated by use of the following key:

Key to the genera of Spirochaetaceae

I. Usually saprophytic, free living in water.
  A. Protoplasm spirally wound around an elastic axis filament. Genus I. *Spirochaeta*
  B. Not as in (A), cross section circular.....Genus II. *Saprospira*
II. Usually parasitic.
  A. Possessing a "crest" or ridge. Parasitic in mussels. Genus III. *Cristispira*
  B. Without a crest. Parasitic in warm blooded animals. Genus IV. *Treponema*

Genus I. **Spirochaeta** Ehrenberg, 1833, p. 313

Synonyms:

Spirochaete Cohn, 1872, p. 180
Spirochoeta Dujardin, 1841, p. 209

Slender, spiral cells, living free, usually in water containing hydrogen sulphide, actively motile, flexuous. Flagella unknown. Anaerobic. Protoplasm is spirally wound around a flexible or elastic

axis filament. Volutin granules regularly present in the plasma. No differentiation of exterior. Cell circular in cross section.

The type species is *Spirochaeta plicatilis* Ehrenberg.

Genus II. **Saprospira** Gross, 1911, p. 188

Slender spiral cells living free in salt water, actively motile, flexuous. Cross section circular.

The type species is *Saprospira grandis* Gross.

Genus III. **Cristispira** Gross, 1910, p. 41

Spiral organisms known only from the crystalline style of mussels. The body of the organism is circular in cross section, more or less spirally wound and possessing a longitudinal comb or crest which does not extend quite to the tips.

The type species is *Cristispira veneris* Gross.

Genus IV. **Treponema** Schaudinn, 1905, p. 1728

Synonyms:

Spirochaeta of many authors
Spirochaete of many authors
Spironema Vuillemin, 1905, p. not *Spironema* Meek, 1864
Microspironema Stiles & Pfender, December 2, 1905, p. 936
Borrelia Swellengrebel, 1907, p. 582.
Spiroschaudinnia Sambon, 1907, p. 833

Cells slender, spiral, not flattened, attenuated at tips, without crest. Multiplication by longitudinal or by cross division. Parasites in warm blooded animals. Motile.

The type species is *Treponema pallidum* Schaudinn.

REFERENCES

Berkeley, M. J. 1857 Introduction to Cryptogamic Botany.

Berkeley, M. J. 1874 Notes on North American Fungi Grevillea, **3**, 64.

Cohn, Ferd. 1872 Untersuchungen über Bakterien. Beitr. z. Biologie der Pflanzen. **1** (Heft. 1): 127–224.

Dobell, C. Clifford 1911 On Cristispera veneris nov. sp. and the Affinities and Classification of Spirochaetes. Quart. J. Mic. Sc. **56**, 507–540.

DUJARDIN, F. 1841 Historie naturelle des Zoophytes, Paris.

EHRENBERG, C. G. 1833 Dritter Beitrag zur Erkenntniss grosser Organisation in der Richtung des kleinster Raumes. Abhandl. Berl. Akad., pp. 145–336.

GROSS, J. 1910 Cristispira nov. gen. Ein Beitrag zur Spirochätenfrage. Mittheil. zool. Stat. Neapel., **20**, 41–93.

GROSS, J. 1911 Ueber freilebende Spironemaceen. Mittheil. zool. Stat. Neapel., **21**, 188–204.

GROSS, J. 1912 Ueber Systematik, Struktur und Fortpflanzung der Spironemacea. Centralbl. f. Bakteriol. Abt. 1, **65**, 83.

KRZYSZTALOWICZ AND SIEDLICKI 1908 Etude experimentale de la Syphilis Morphologie de *Spirochaeta pallida*. Bull. Acad. Sci. Cracovie. p. 173.

LINK, H. 1795 Dissertationes botanicae. Sverini.

SAMBON, L. 1907 In Manson's Tropical Diseases. p. 83.

SCHAUDINN, F. 1905 "Korrespondenzen" Deutsche med. Wchnschr. **31**, 1728.

SCHROETER, J. 1886 Die Pilze, in Conn's Kryptogamen Flora von Schleisen.

STILES, C. W., AND PFENDER, C. A. 1905 The generic name of the parasite of syphilis. Am. Med. **10**, 936. Dec. 2.

SWELLENGREBEL, M. 1907 Sur la cytologie comparee des Spirochetes. Ann. de l'Inst. Pasteur. **21**, 448 and 562.

THAXTER, ROLAND 1892 On the Myxobacteriaceae, a new order of Schizomycetes. Bot. Gaz. **17**, 394.

VUILLEMIN, PAUL 1905 Sur la denomination de l'agent de la syphilis. Compt. rend. Acad. d. sc. Par. **140**.

ZUKAL, H. 1896 Myxobotrys variabilis Zuk. als Reprasentant einer neuen Myxomyceten Ordnung, Ber. d. deutsch. Bot. Gesellsch. **14**, 346.